INTELLIGENT TOUCH DISPLAY

RELATED APPLICATIONS

This application is related to U.S. patent application Ser. No. 08/985,265, entitled NAVIGATIONAL TOOL FOR GRAPHICAL USER INTERFACE; and U.S. patent application Ser. No. 08/985,261, entitled CONTEXTUAL GESTURE INTERFACE, both of which are filed concurrently herewith, and both of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

The present invention relates generally to graphical user interfaces (GUI), and more particularly to a touch-responsive user interface for graphical user interfaces.

Until relatively recently, software-based documents have been primarily viewed and manipulated on desktop or laptop computers with relatively large displays, typically 640×480 pixels or larger. These displays are often large enough to display a full page of standard size page or at least a significant portion of the page. Hence, on-screen graphical menus and controls displayed in window of an application did not greatly reduce the display area for the underlying document. Computers also have peripheral devices such as a keyboard or a mouse to control the display of content information. Thus, viewing and navigating around a single-page or multi-page document have not posed much difficulty.

Due to increasing focus on compactness of electronic devices, however, the displays especially in portable electronic devices are becoming smaller and smaller. Popular electronic devices with a smaller display area include electronic organizers, PDA's (personal digital assistants), and graphical display-based telephones. Also available today are communicators that facilitate various types of communication such as voice, faxes, SMS (Short Messaging Services) messages, e-mail, and Internet-related applications. These products can likewise only contain a small display area.

To enable users to navigate around a full page of content information, these devices typically provide hard-keys for arrows as shown in FIG. **1**. The hard-keys, however, not only increase the size but also add to the cost of the devices. Also, hard-keys generally provide limited options for direction of movement, e.g., vertical or horizontal. They generally do not provide the freedom to move in any direction.

Some displays of these devices also require a separate stylus having peripheral technology that requires transmission of electromagnetic pulses or light to the display. These devices often require additional controllers such as buttons on the body or the tip of the stylus for activation. Furthermore, these styli require a power source, either through wire or battery, and their compatibility is generally limited to a specific device.

As shown in FIG. **2**, other devices substitute hard-keys with graphical onscreen arrows or scroll bars that are typically used in full-size computer displays. The on-screen scroll bars, however, occupy valuable screen real estate and compound the limitations of small displays. Similar to the hard-keys, the onscreen arrows also generally restrict the navigational movement to horizontal or vertical direction.

In other forms of on-screen GUIs, e.g., pop-up menus, also take up valuable screen space, further reducing the available display area for content information. Additionally, on-screen pop-up menus typically provide available functions in multiple layers, thus requiring a user to move deeply into the hierarchy before reaching the desired function. This is time consuming and renders the GUI cumbersome and ineffective.

Therefore, it is desirable to provide navigation tools that allow small-size devices while maximizing the use of available screen real estate.

It is also desirable to provide tools to navigate within a document at any direction at varying speeds.

It is further desirable to provide navigation tools that can be activated without requiring specific electronic devices.

In addition, it is further desirable to provide an improved GUI that simplifies GUI by recognizing various characteristics of the touch input.

SUMMARY OF THE INVENTION

Systems and methods consistent with the present invention provide a graphical touch-responsive user interface for display devices.

Specifically, a method consistent with this invention of providing a touch-responsive user interface comprises several steps. Initially, the apparatus detects an object making contact with a physical viewing area, and determines a pointer size of the object. Thereafter, the system activates a function corresponding to the pointer size.

A system consistent for this invention for providing a touch-responsive user interface comprises detecting means, determining means, and activating means. The detecting means detects an object making contact with a physical viewing area. The determining means determines a pointer size of the object, and the activating means activates a function corresponding to the pointer size.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate the invention and together with the description, serve to explain the principles of the invention.

In the drawings,

FIG. **1** shows conventional hard-key arrows for navigation control;

FIG. **2** shows conventional on-screen graphical navigation tool;

FIGS. **3A–3B** are diagrams of an exemplary mobile telephone consistent with the principles of the present invention;

FIG. **4** is a block diagram showing the elements of the mobile telephone of FIG. **3A**;

FIG. **5** is a block diagram showing the components of the memory of FIG. **4**;

FIG. **6** is a block diagram of touch screen functionalities;

FIGS. **7A–7B** show an exemplary inactive and active graphical navigation tool, respectively;

FIG. **8** is a sample screen showing an active navigation tool;

FIGS. **9A–9C** show exemplary features of the navigation tool;

FIGS. **10A–10C** are sample screens showing the navigation tool performing various navigation functions;

FIGS. **11A–11B** show exemplary features of the navigation tool relating to speed of navigation;

FIG. **12** is a diagram illustrating a touch point distribution; and

FIG. **13** is a flowchart illustrating the process of determining the size of the object making contact with the viewing area.